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# STERILITY AMONG HYBRIDS*

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IN choosing sterility to demonstrate some of the metabolic aberrations of hybrids, I do so because in this condition a certain number of difficult variables can be easily eliminated. We are taught that all physiological variations are congenital or acquired. Since sterility cannot be laid at the door of heredity it must be acquired. We are likewise taught that all complaints of the human body are either functional or organic. In this discourse I do not propose to discuss any form of sterility that has an anatomical cause from the pathological viewpoint. It has been estimated that in the United States there are to-day nearly two million sterile couples who are still at the age of childbearing, and it is needless to say that in many cases it is the disappointment of a lifetime, especially to those who take their citizenship seriously. Since I intend to discuss here only functional sterility, allow me to review briefly some of the outstanding cases of this condition found in animal breeding.

The common mule has been recognized as sterile since the days of Homer, though Columnella quotes from Mago, a Carthaginian agriculturist, that in his country the fecundity of the mule was a frequent event, although it was regarded as a prodigy in Greece and Italy. He adds that these mixed mules do not cross again with one another, but only with the primitive species that gave them birth. Others have discussed the fact of sterility among mules in the northern climates. I am inclined to put some credence in this statement with regard to geographic latitude, as I will mention later that calcium metabolism is an important factor of infertility.

The female mule when fecundated with a male ass seldom reaches the full term of pregnancy. Abortion is very common in these pregnancies of heterogenous species. Another interesting point that need only be mentioned here is the variation in the term of pregnancy. It is worthy of remark that the dingo of Australia when crossed with the common dog becomes sterile at the fourth generation. The hybrids produced by the cross of the common fowl with guinea fowl have been found to be sterile up to the present time of writing.

The common wild goose mates with domestic geese, but the offspring are sterile. The same is true of hybrids, resulting from the cross between the goose and the swan. Of some five hundred species of wild pigeons, Darwin could not find a single well ascertained instance of hybrids between two species being fertile among themselves, or even when crossed with one of the pure parents.

In the cross between the wild passenger pigeon with the cage ring dove, the males are invariably infertile. In regard to this work with pigeons, Whitman states "The infertility is not to be confounded with sterility; it stands rather for various degrees of specific incompatability between the germ cells of the cross-mated birds..... in many cases the development of the egg is carried far enough to show that the sperm has entered and fertilized it. The development may halt at this point, or be carried to any later stage, even to hatching. The young

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bird may die within a few hours or live on, apparently doing well, for several days, a week or more, and then drop off, as if life were a time fuse calculated to end at a definite moment..... The author finds that the length of course to be run, although varying widely, is on the average cut shorter and shorter as the crosses range from close allies, to more distantly related species."

Facts along this same line are quoted by Meaker, of work done by Cuenot, and by Castle and Little on yellow mice. He states "these mice are an impure strain, carrying yellow as a dominant and black as a recessive colour. characteristic". According to Mendelian expectations of four offspring from such parents one should be pure black, one pure yellow, and two mixed, these last being yellow since that characteristic is dominant over the recessive black. As a matter of fact, the offspring were correctly proportioned with regard to the pure blacks and the mixed, but the yellow never appeared. Little found that the missing offspring actually started to develop but were invariably blighted at an early period of embryonic life. The reason appears to be that there are certain hereditary qualities capable of transmission according to Mendel's law which are in their very nature inimical to the development of an embryo which carries them.

This is a case of relative sterility. Morgan working on the fly Diosophila has produced a strain of which two members mated together are always sterile, while a male or female of the strain in question is fertile if mated with a partner of another strain.

Turning now to human beings I would begin by stating that the mulatto is not so fertile as the pure black or pure white types. Statistics show that where the coloured population of the United States has the largest number of mulattoes, the birth rate is much lower than where the coloured population is pure black. Physically the mulatto is inferior to either of the races that gave him cause. Physical deterioration may have its exceptions in racial crosses. Sulivan states that "the part Hawaiian is an improvement on the Hawaiian stock although the birth rate is lower". It has been mentioned that sterility is rather common in Jewish-Gentile marriages. The cross between the European and the Australian aborigines is almost sterile.

All these examples are among what are recognized as different races. But in these cases after all, is not the accepted racial difference due to the fact that recent history comes forward with proof of the difference? History is of undoubted value in the solution of the problem, but not by any means the only remedy. Ottenberg tabulated the percentages of various nationalities falling into each of the four blood groups. From this work might be drawn the conclusions that the African and Mediterranean peoples are predominantly in Group 1, the Teutonic and Celtic peoples mostly in Group 2, and those whose national home is known to be peopled with a liberal Mongolian mixture, fall mostly in Group 3.

These figures given by Ottenberg fell short of their mark in these regards. It is not stated whether the blood tests in question were done on sick people or well people, or whether those marked English, German, etc., are concerning the fair types or brunette types. There is that fog about the mass of figures which often surrounds a great multiplicity of cases. The veil that obscures truth is very adherent and must be removed thread by thread, otherwise wisdom is still incomplete.

In this discussion I intend to limit my remarks to observations on the results of crosses between blue and brown eyed individuals. One reason for this factor being taken, is that since colour of eyes follows the Mendelian formula, it is useful in studying racial mixtures. Second it is information that can be got fairly easily by history. Third, because in colour there is evidence of nature's hand having wrought very thoroughly and with definite purpose. Black cannot be white, nor white, black. There must be a marked difference in the constitution of an individual with blue eyes and one with brown eyes. Considerable opinion has been advanced by Dr. Crookshank to show that the human race is of three distinct species, namely, the Mongolian, Ethiopian, and Caucasian. Since our daily rounds bring us in contact for the most part with the Caucasians of western Europe, it is their composition and peculiarities with which we are most concerned.

Western Europe is divided east and west by a range of mountains, the Alps, which for many

thousands of years undoubtedly acted as a natural barrier to the wanderings of the early human race. On each side of this barrier grew up races with physical characteristics suitable to the climate and latitude inhabited by them. On the south side of the Alps we have a race with brown eyes, the colour being, without doubt, to shut out from the delicate nervous mechanism of the retina as many of the sun's rays as possible. On the north side of the Alps we have a blue eyed race, the blue colouring being to shut out only part of the rays shown in the solar spectrum. The rays being more oblique in that latitude and therefore fewer in number, only the hotter ones needed to be filtered out.

I can recall a man whose family characteristic gave him a medium height with a mental alertness beyond the average, his wife was taller than he, by about three inches, with a very placid disposition. These characteristics I learn, belong to her family. This couple have three grown up sons. One has his mother's height, and mental attitude. Another has his mother's height but his father's mental alertness. The third has his father's height but his mother's placid disposition. If this man complains that none of his sons are as good men as he is, the Mendelian school I think would answer that the fourth son who ought to have been like him in all regards was never born. I pick this family because factors of complexion and physical weakness can be ruled out for a period of years back, since having descended from U.E.L. stock, records are fairly complete.

It has been stated by Sir Arthur Keith that a pituitary excess exists in the negro. I have been able to satisfy myself that this is also the case in many brown eyed individuals. I am also quite satisfied that the thyroid gland is much more active in the fair blue-eyed races than it is in the brown-eyed races. These differences in the endocrine activities are undoubtedly a method of nature to adapt the individual to his climatic surroundings.

*If the endocrine glands follow the Mendelian formula, it is not, I think, too imaginative to picture a cross between southern and northern individuals, with a southern pituitary function, and a northern thyroid function, and vice versa. I am satisfied that many such combinations exist, much to their own physical discomfort.* I have never seen a functionally sterile individual, male or female, whose parents did not have opposite coloured eyes. If such exist I am willing to concede that there are other factors in functional sterility besides racial differences in the parents. One case I wish to quote at length is that of a young woman who, previous to her marriage, seemed sexually normal. Her menstruation was normal and without pain. Her health was well up to average. Shortly after her marriage she began to have dysmenorrhœa about every three or four months, the intervals being irregular. She also after some ten years of married life has suffered from a pronounced anæmia and is frequently taking tonic mixtures of various kinds. She has never been pregnant to her knowledge. The husband's semen has been examined and found normal. About four years ago she had a uterine curettement done with no change in the sterility or dysmenorrhœa. This woman stands about five feet eight inches in height and has dark brown eyes. Her father stands about five feet seven inches and has blue eyes. Her mother is about five feet five inches tall and has brown eyes. It can be seen she is taller than either of her parents and takes her eye colour from the maternal side. She states that her paternal grandmother was about her height. Her husband is slightly taller than she is and has blue eyes. Why did dysmenorrhœa begin after marriage in this case? From careful enquiries I am of the opinion that this woman gets pregnant every few months and for reasons of certain endocrine unbalance, aborts at the usual menstruation. This is highly possible when one considers that when pregnancy takes place, either the pituitary secretion is inhibited or the uterine muscle is rendered unresponsive to it. A combination of the two are most likely. In this case the change possibly does not take place and abortion occurs.

A second case I will quote of a woman twenty-eight years old who had been married five years and never had been pregnant. Menstruation had been more profuse on most occasions since her marriage, and her health was not the best. She consulted me for various ailments one of which was eczema on the hands and face. Among other things I prescribed 10 grains of calcium lactate three times daily. She did not menstruate again for over nine months and gave birth to twin girls.

This woman's father was about five feet ten inches tall with brown eyes, her mother about five feet eight inches in height with blue eyes and dark hair. The patient in question is about five feet six inches tall with blue eyes and fair hair. Her husband also had blue eyes and fair hair. I will leave it to the biochemist to speculate on the rôle played by the calcium in this pregnancy. The endocrinologists will likely claim that it is another case of glandular dysfunction. I have tried calcium lactate on other sterile patients without the result desired being accomplished.

It is not, I think, out of place here to mention a condition that I have found common in fair haired women giving birth to brown eyed infants. The fœtal head often gets impacted against the pubis, and prolongs delivery unduly in such conditions. It will be recalled that the southern woman's pelvic ratio is much higher than that of the northern woman. It will also be recalled that the Mediterranean peoples have a lower cephalic index. This lack of harmony in anatomical structures is a possible cause for the condition I have quoted, and also a cause of relative sterility in women whose children are not born alive.

I have asked mothers in these mixed families to name their children whose birth was difficult. On taking the cephalic indices of the various children I have found that the one whose birth was stated to have been difficult had an index of at least five points lower than the others. In some twenty cases I have only found one brown-eyed individual whose cephalic ratio was over 80. These results do not include any Mongolians. Such measurements, of course, must be taken after ossification has completed to be accurate. I have made measurements of mother and child in three of my recent cases. I have found in all three that the index was five points or more less in the child than the mother. The anatomists in the future, I hope, will be able to state with some degree of authority whether there is a definite cephalic-pelvic relation.

That races do not persist in other than their native climate I am well aware. A race can only disappear by three means; sterility, disease, and migration. For thousands of years the African races were carried to the north shore of the Mediterranean as slaves. In the age of Pericles the slave population of Greece outnumbered the free citizens by three to one. As slave owners prefer to breed slaves rather than buy them, there is no doubt that these slaves were bred, and on becoming free, mixed with the slaves of different origin. At the present time no trace can be found of the African races on the north shore of the Mediterranean. They came and were responsible for the construction of works whose ruins no progeny has survived to see the ruins of.

During the sixteenth and seventeenth centuries some of the most aggressive and creative amongst the Spanish and Portugese races settled in Brazil. At the present time no full blooded Spaniard is to be found in many parts of that country. These people came and brought their language and their civilization, but they themselves have disappeared.

The harm done by racial mixtures I believe is much wider than the scope of this paper. Its importance as a factor in asthma, eczema and spasmophilia are beyond question to me. So wrapped up it seems are racial mixtures with the ailments of mankind, that I have almost reached the stage that I would dogmatically assert that "If you show me a family where the doctor is metaphorically always on the doorstep, I will show you a family of profound racial mixture."

Let us, as the trained interpreters of the ills of mankind delve more deeply into the reasons that bring sorrow to so many households. Whether it be the disappointment of a sterile marriage, the disheartening result of child after child being born dead, or the financial embarrassment because it is too often sterile individuals who set a community's social pace, it matters not. The world and civilization did not reach its present status by sterility either relative or absolute. There is a cause, and the cause can be found, providing we jointly put forth our efforts to interpret our experiences, and at all times bear a virtuous tolerance toward those who attempt to assist us, even though we differ from them in minor details.

In conclusion, let me voice these opinions: firstly, that the individual who has one parent with blue eyes and the other with brown eyes, is not so normal in health and fertility as one who is derived from pure stock.

Secondly, that marriages between brown-eyed

men and blue-eyed women are likely to lead to difficult labour and perhaps still birth in case of pregnancy, due to incompatibilities between the shape of the fœtal head and the mother's pelvis.

Lastly, since the results mentioned above become a national problem they should not be treated lightly, especially when one recalls that in the world's history nations have always arisen to their greatest heights when their racial stock was most pure, and crumbled to decay when their racial components were most varied.

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# ABRUPTIO PLACENTÆ

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THE term "*abruptio placentæ*" (from the Latin "ab" and "rumpere", meaning to break away from) is nowadays rather generally applied to that condition formerly referred to as "accidental hæmorrhage", and refers to those cases where uterine bleeding occurs from separation of the placenta from its normal situation; *i.e.*, separation from a site above the upper zone of dilatation.

*Frequency.*—From the following figures it will be seen that the experiences of various clinics show marked differences in the frequency of this condition:

| *Hospital* | *Cases of Labour* | *Separation* | *Incidence* |
|---|---|---|---|
| Sloan Maternity .... | 20,000 | 212 | 1.06% |
| New York Lying-in .. | 100,000 | 254 | .254% |
| Rotunda ..... | 6,453 | 70 | 1.08% |
| Providence Lying-in.. | 914 | 7 | .765% |

Holmes of Chicago states that the clinical incidence is somewhere about one case in 500, and of pathological interest in about one in 200 cases.

*Etiology.*—Four main divisions of placental separations based on etiological differences, may be recognized.

(a) *Traumatic.*—Trauma is undoubtedly a factor in many cases. History is sometimes obtained of intended or accidental violence to the mother, occasionally of some particular over exertion, which would be, conceivably, sufficient cause for placental separation. There is little doubt, however, that in many cases where there is a history of only some slight trauma, there are co-existent pathological changes at the utero-placental site. Passage of large catheters or bougies for induction of labour may cause placental separation, but this would doubtless be recognized before serious consequences, if in careful hands.

Where a true or relatively short cord is present, late in the second stage of labour, the placenta may be pulled from its insertion, but here the obstetrician will be able to deal quickly with the situation without serious consequences to mother or child. The sudden emptying of a large hydramnion causing a negative pressure within the uterus, the loosening of the placenta sometimes seen after the delivery of the first twin, and intra-uterine manipulation during labour, may be included as possible causes under this heading.

(b) *Localized pathological changes at the* utero-placental site.—Under this heading may be mentioned such conditions as infarctions of the uterus due to emboli; any mechanical condition cutting off the circulation to a part of the uterine wall; uterine tumours exerting mechanical pressure, and thus by altering the fœtal and maternal circulatory relations, leading mechanically to separation of the placenta, and such placental diseases as syphilis and tuberculosis, which may lead to fatty and amyloid degeneration. Infarctions and cystic degenerations of the placenta may also be mentioned.

(c) *Systemic evidences of toxæmia with pathological changes, in the kidney, uterus and placenta.*—Minute hæmorrhages are usually noted in these cases between the muscle fibres and fasciculi, and in addition inflammatory and degenerative changes may be seen in the uterus and placenta; albumin and casts are found in the urine, with œdema and increased blood pressure.